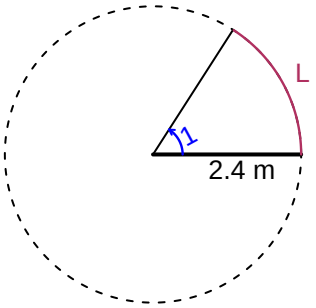
Name: Date:

Trig Final (Solution v49)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 1 radians. The radius is 2.4 meters. How long is the arc in meters?

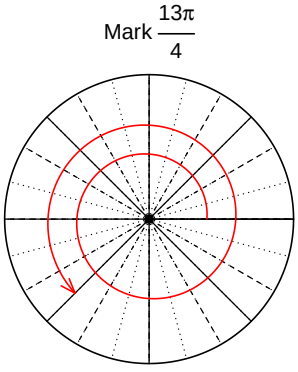


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

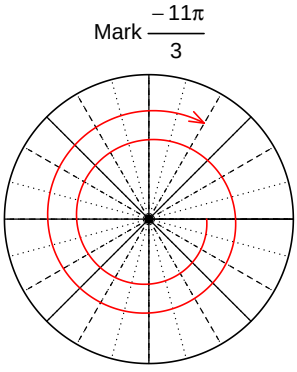
$L = 2.4$ meters.

Question 2

Consider angles $\frac{13\pi}{4}$ and $\frac{-11\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{13\pi}{4}\right)$ and $\cos\left(\frac{-11\pi}{3}\right)$ by using a unit circle (provided separately).



Find $\sin(13\pi/4)$



Find $\cos(-11\pi/3)$

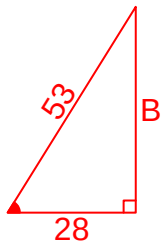
$\sin(13\pi/4) = \frac{-\sqrt{2}}{2}$

$\cos(-11\pi/3) = \frac{1}{2}$

Question 3

If $\cos(\theta) = \frac{28}{53}$, and θ is in quadrant IV, determine an exact value for $\tan(\theta)$.

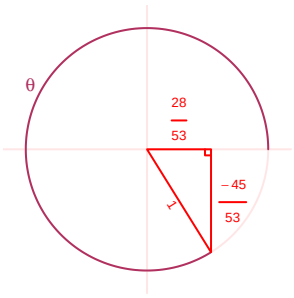
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$28^2 + B^2 = 53^2$$
$$B = \sqrt{53^2 - 28^2}$$
$$B = 45$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\tan(\theta) = \frac{\frac{-45}{53}}{\frac{28}{53}} = \frac{-45}{28}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -4.26$ meters, a frequency of 6.98 Hz, and an amplitude of 8.56 meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -8.56\sin(2\pi 6.98t) - 4.26$$

or

$$y = -8.56\sin(13.96\pi t) - 4.26$$

or

$$y = -8.56\sin(43.86t) - 4.26$$